

# SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-43

**Name:** East Oakwood Lake **County:** Brookings

**Legal Description:** T111N- R51W-Sec. 4-5, 8-9, 16-17

**Location from nearest town:** 3 miles west of Bruce, SD

**Dates of present survey:** July 27-29, 2010

**Date last surveyed:** July 28-30, 2008

Managed Species	Other Species
Walleye	White Sucker
Yellow Perch	Tadpole Madtom
Northern Pike	Green Sunfish
Common Carp	
Bigmouth Buffalo	
Black Bullhead	

## PHYSICAL DATA

**Surface Area:** 928 acres

**Maximum depth:** 9 feet

**Volume:** 5000 acre-feet

**Contour map available:** Yes

**OHWM elevation:** 1626.9

**Outlet elevation:** 1626.4

**Lake elevation observed during the survey:** Full

**Beneficial use classifications:** (5) warmwater semipermanent fish propagation, (7) immersion recreation, (8) limited-contact recreation and (9) fish and wildlife propagation and stock watering.

**Watershed:** 50,999 acres

**Mean depth:** 5 feet

**Shoreline length:** 10.7 miles

**Date mapped:** 1964

**Date set:** October, 1981

**Date set:** October, 1981

## **Introduction**

The Oakwood Lakes complex derived its name from the numerous oak trees found in the area. East Oakwood Lake was originally named Oakwood Lake while West Oakwood was originally known as Lake Tetonkaha. East Oakwood is a natural glacial lake with an outlet that flows into the Big Sioux River.

## **Ownership of Lake and Adjacent Lakeshore Properties**

East Oakwood Lake is listed as a meandered lake in the State of South Dakota Listing of Meandered Lakes and the fishery is managed by the South Dakota Department of Game, Fish and Parks (GFP). The north, west, and south shorelines are owned and managed by GFP while the east shoreline is privately owned.

## Fishing Access

There is a single lane, concrete plank boat ramp located on the north shore of the lake. Another ramp is planned for the west side south of the park entrance booth. Shore fishing opportunities are available on the south shore and at various locations on the north and west shores.

## Field Observations of Water Quality and Aquatic Vegetation

Water clarity during the survey was fairly good with a Secchi depth measurement of 1 m (39.4 in). A small amount of sago pondweed (*Potamogeton pectinatus*) was observed and common cattail (*Typha spp.*) was present in the western bays.

## BIOLOGICAL DATA

### Methods:

East Oakwood Lake was sampled on July 28-29, 2010 with three overnight gill net sets and 10 overnight trap net sets. The trap nets are constructed with 19-mm-bar-mesh ( $\frac{3}{4}$  in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. The gill nets are 45.7 m long x 1.8 m deep (150 ft long x 6 ft deep) with one 7.6 m (25 ft) panel each of 13, 19, 25, 32, 38 and 51-mm-bar-mesh ( $\frac{1}{2}$ ,  $\frac{3}{4}$ , 1,  $1\frac{1}{4}$ ,  $1\frac{1}{2}$ , and 2 in) monofilament netting. Sampling locations are displayed in Figure 4.

### Results and Discussion:

## Gill Net Catch

Yellow perch (65.6%), and walleye (30.5%), were the most common species sampled in the gill nets (Table 1). Common carp, white sucker, northern pike, black bullhead, and bigmouth buffalo were also sampled.

**Table 1.** Total catch from three overnight gill net sets at East Oakwood Lake, Brookings County, July 27-29, 2010.

Species	Number	Percent	CPUE <sup>1</sup>	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Yellow Perch	605	65.6	201.7	<u>+53.4</u>	51.0	0	0	108
Walleye	281	30.5	93.7	<u>+20.4</u>	50.9	--	--	--
Common Carp	17	1.8	5.7	<u>+1.5</u>	11.6	--	--	--
White Sucker	13	1.4	4.3	<u>+2.4</u>	3.4	54	31	106
Northern Pike	3	0.3	1.0	<u>+0.0</u>	2.4	--	--	--
Black Bullhead	2	0.2	0.7	<u>+0.4</u>	37.0	--	--	--
Bigmouth Buffalo	1	0.1	0.3	<u>+0.4</u>	2.5	--	--	--

\* 5 years (2000, 2002, 2004, 2006, 2008)

<sup>1</sup> See Appendix A for definitions of CPUE, PSD, and mean Wr.

**Table 2.** Catch per unit effort by length category for various fish species captured with gill nets in East Oakwood Lake July 27-29, 2010.

Species	Substock	Stock	S-Q	Q-P	P+	All sizes	80% C.I.
Yellow Perch	196.3	5.3	5.3	--	--	201.7	+53.4
Walleye	92.7	1.0	--	1.0	--	93.7	+20.4
Common Carp	5.0	0.7	--	--	0.7	5.7	+1.5
White Sucker	--	4.3	2.0	1.0	1.3	4.3	+2.4
Northern Pike	0.7	0.3	--	0.3	--	1.0	+0.0
Black Bullhead	--	0.7	0.7	--	--	0.7	+0.4
Bigmouth Buffalo	0.3	--	--	--	--	0.3	+0.4

\*Length categories can be found in Appendix A.

### **Trap Net Catch**

Common carp, (91.6%), yellow perch (3.4%), and black bullhead (2.5%) were the most abundant species in the trap-net sample (Table 2). Other species sampled included northern pike, white sucker, walleye, bigmouth buffalo, and black crappie.

**Table 3.** Total catch from ten overnight trap net sets at East Oakwood Lake, Brookings County, July 27-29, 2010.

Species	Number	Percent	CPUE	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Common Carp	1,389	91.6	138.9	+73.8	15.1	100	100	83
Yellow Perch	52	3.4	5.2	+1.7	5.6	4	2	99
Black Bullhead	38	2.5	3.8	+2.0	268.6	11	0	89
Northern Pike	12	0.8	1.2	+0.6	1.0	--	--	--
White Sucker	9	0.6	0.9	+0.6	13.7	--	--	--
Walleye	9	0.6	0.9	+0.6	10.4	--	--	--
Bigmouth Buffalo	5	0.3	0.5	+0.4	1.9	--	--	--
Black Crappie	3	0.2	0.3	+0.2	0.0	--	--	--

\* 5 years (2000, 2002, 2004, 2006, 2008)

**Table 4.** Catch per unit effort by length category for various fish species captured with trap nets in East Oakwood Lake July 27-29, 2010.

Species	Substock	Stock	S-Q	Q-P	P+	All sizes	80% C.I.
Common Carp	136.1	2.8	--	--	2.8	138.9	+73.8
Yellow Perch	--	5.2	5.0	0.1	0.1	5.2	+1.7
Black Bullhead	--	3.8	3.4	0.4	--	3.8	+2.0
Northern Pike	0.6	0.6	--	0.5	0.1	1.2	+0.6
White Sucker	--	0.9	--	0.2	0.7	0.9	+0.6
Walleye	0.1	0.8	--	0.8	--	0.9	+0.6
Bigmouth Buffalo	--	0.5	--	0.3	0.2	0.5	+0.4
Black Crappie	--	0.3	0.3	--	--	0.3	+0.2

Length categories can be found in Appendix A.

## **Walleye**

**Management objective:** To maintain a walleye population with a gill-net CPUE of at least 15, 25 cm (10 in) or longer fish in three out of five lake surveys.

Walleye management in East Oakwood is a constant challenge due to frequent winterkills of varying severity. Walleyes stocked following winterkills in 1997, 2001, 2007 and 2010 produced fast-growing, quality populations but only short periods of good fishing were enjoyed before another winterkill occurred. Age-0 walleyes from the 2010 stocking comprised 99% of this year's sample (Table 5).

**Table 5.** Walleye gill-net CPUE, PSD, RSD-P, and mean Wr for East Oakwood Lake, Brookings County, 2002-2010.

	2002	2003	2004	2005	2006	2007	2008	2009	2010
CPUE	6.3		67.0		139.0		30.3		93.7
PSD	0		100		100		0		--
RSD-P	0		0		12		0		--
Mean Wr	99		103		91		--		--

## **Yellow Perch**

**Management objective:** To maintain a yellow perch population with a gill-net CPUE of at least 25, 13 cm (5 in) or longer fish in three out of five lake surveys.

Yellow perch gill-net CPUE over the last 10 years would indicate they tolerate low oxygen levels and survive winterkill better than walleyes (Table 4, Table 3). Gill-net CPUE increased this year (Table 6); however 97% of the sample was age-0 fish (Figure 2).

**Table 6.** Yellow perch gill-net CPUE, PSD, RSD-P, and mean Wr for East Oakwood Lake, Brookings County, 2002-2010.

	2002	2003	2004	2005	2006	2007	2008	2009	2010
CPUE	66.0		14.3		87.5		55.0		201.7
PSD	17		79		3		4		0
RSD-P	1		67		0		0		0
Mean Wr	108		102		94		111		108

## **Black Bullhead**

**Management objective:** To maintain a black bullhead population with a trap-net CPUE of less than 100, 15 cm (6 in) or longer fish in three out of five lake surveys.

Black bullhead trap-net CPUE decreased substantially after the 2010 winterkill (Table 7) and the fish sampled had a mean length of 196 mm (7.7 in) (Figure 3).

**Table 7.** Black bullhead trap-net CPUE and PSD for East Oakwood Lake, Brookings County, 2002-2010.

	2002	2003	2004	2005	2006	2007	2008	2009	2010
CPUE	545.8		7.9		67.2		289.5		3.8
PSD	5		3		2		2		11
RSD-P	0		3		0		0		0
Mean Wr	--		82		105		96		89

## **All Species**

Netting results demonstrate that the 2010 winterkill had an impact on the fish community in East Oakwood (Table 8). Yellow perch and common carp produced large year classes, stocked walleyes were abundant, and a black crappie was sampled for the first time.

**Table 8.** Gill-net (GN) and trap-net (TN) CPUE for all fish species sampled in East Oakwood Lake, Brookings County, 2002-2010.

Species	2002	2003	2004	2005	2006	2007	2008	2009	2010
COS (GN)	0.3		--		--		--		--
COS (TN)	--		--		--		--		--
COC (GN)	48.0		0.3		6.0		1.3		5.7
COC (TN)	51.4		10.4		2.4		5.5		138.9
WHS (GN)	0.7		1.3		1.5		9.3		4.3
WHS (TN)	22.6		11.2		20.9		9.6		0.9
BIB (GN)	0.7		6.3		--		2.0		0.3
BIB (TN)	1.6		1.9		0.5		1.0		0.5
BLB (GN)	21.0		4.7		18.0		--		0.2
BLB (TN)	545.8		7.9		67.2		289.5		3.8
YEB (GN)	--		--		--		--		--
YEB (TN)	--		--		0.1		0.3		--
TMT (GN)	--		--		--		--		--
TMT (TN)	7.7		2.7		2.5		--		--
NOP (GN)	1.0		1.7		0.5		8.0		1.0
NOP (TN)	0.4		0.3		1.0		1.2		1.2
GSF (GN)	--		--		--		--		--
GSF (TN)	0.3		0.3		0.1		--		--
OSF (GN)	--		1.3		8.5		--		--
OSF (TN)	--		0.3		4.9		--		--
BLC (GN)	--		--		--		--		--
BLC (TN)	--		--		--		--		0.3
YEP (GN)	66.0		14.3		87.5		55.0		201.7
YEP (TN)	2.1		1.9		14.7		5.1		5.2
WAE (GN)	6.3		67.0		139.0		30.3		93.7
WAE (TN)	0.9		1.3		46.7		--		0.9

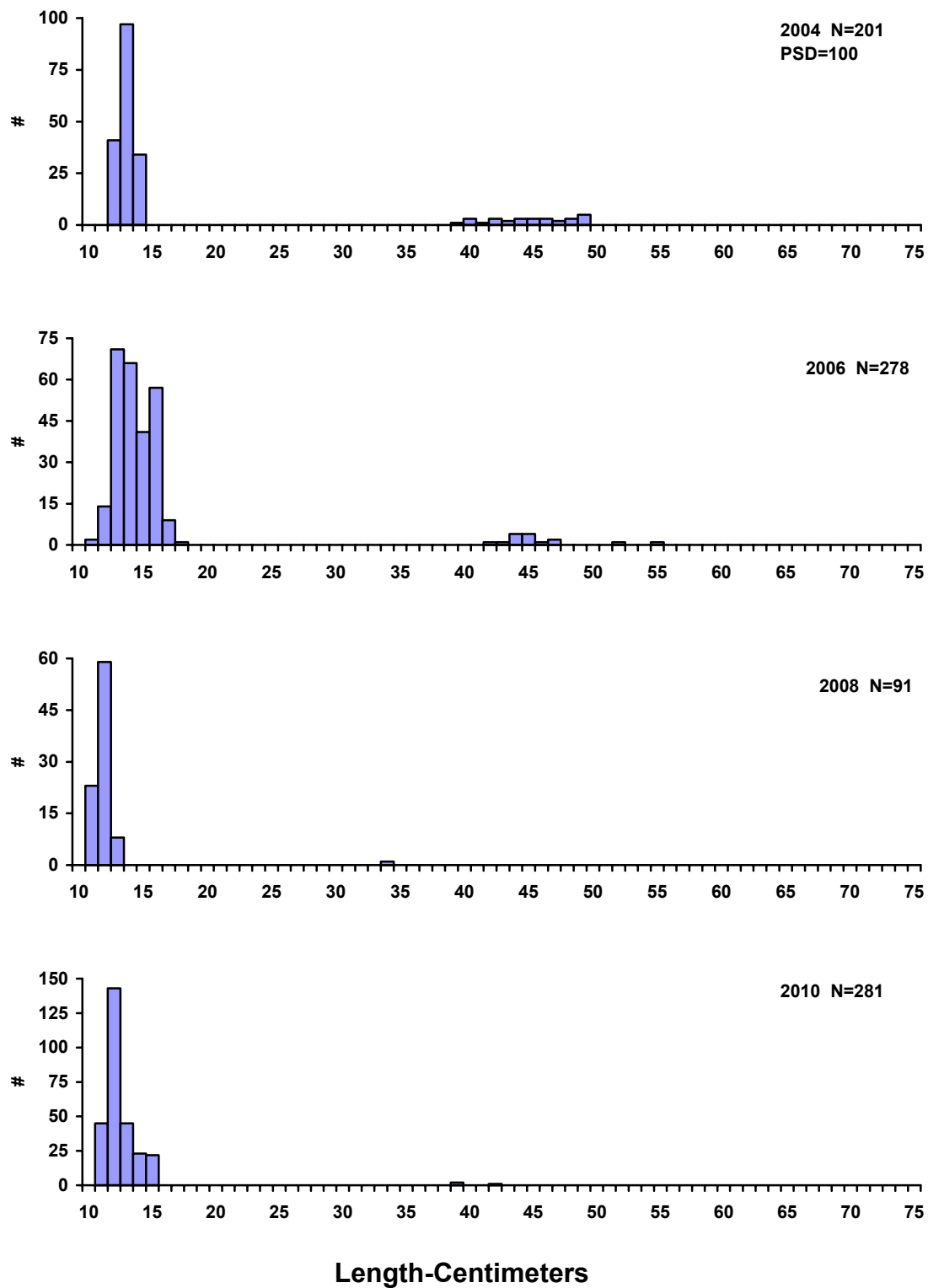
COS (Common Shiner), COC (Common Carp), WHS (White Sucker), BIB (Bigmouth Buffalo), BLB (Black Bullhead), YEB (Yellow Bullhead), TMT (Tadpole Madtom), NOP (Northern Pike), GSF (Green Sunfish), OSF (Orange-spotted Sunfish), YEP (Yellow Perch), WAE (Walleye)

## **MANAGEMENT RECOMMENDATIONS**

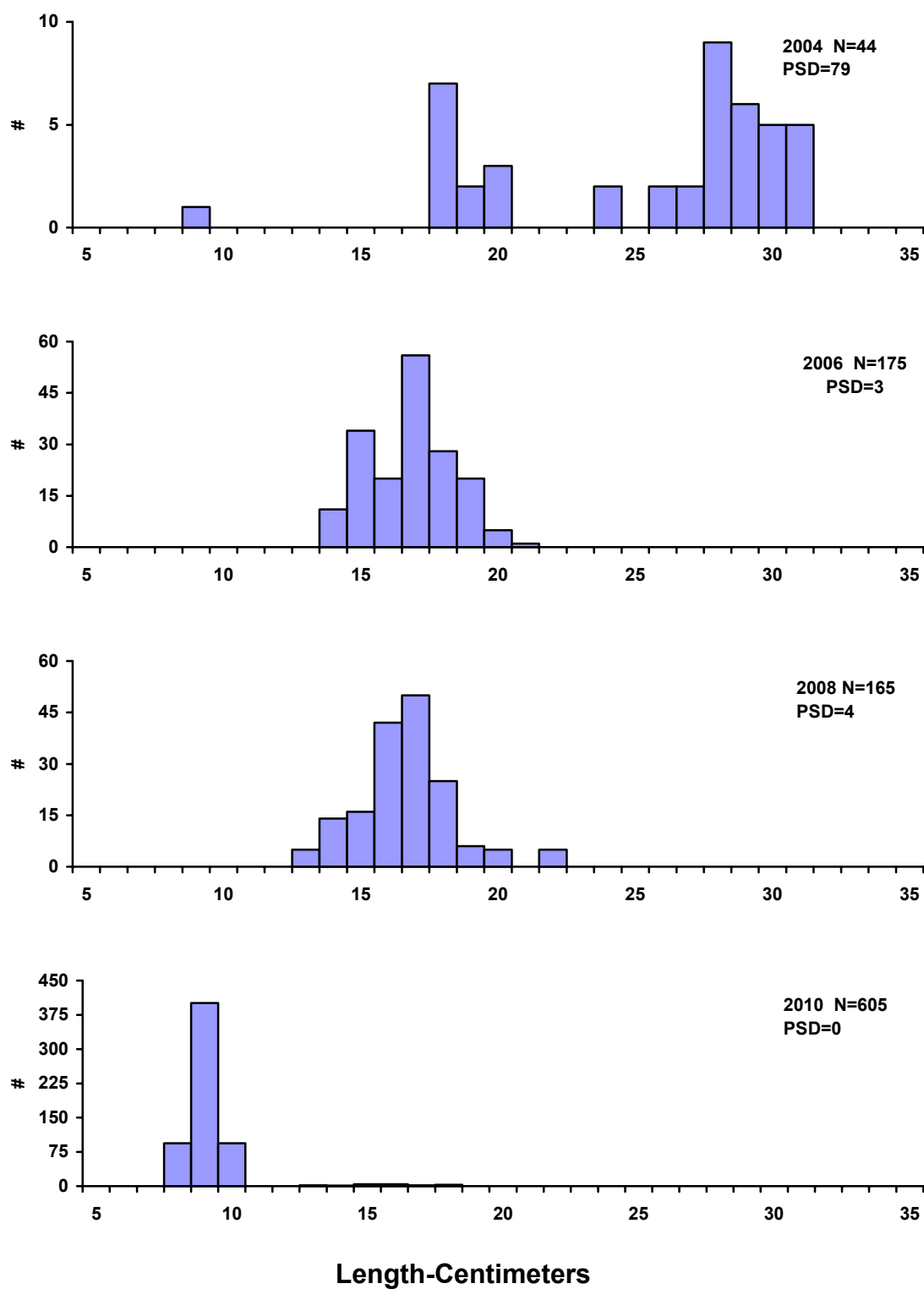
1. Stock walleye fry or fingerlings to reestablish the population after winterkills and as needed to accomplish the management objective.
2. Stock yellow perch fry, fingerlings or adults to reestablish the population after winterkills and as needed to accomplish the management objective.
3. Accomplish the black bullhead management objective by maintaining walleye abundance.
4. Monitor the East Oakwood fishery by continuing to conduct lake surveys every other year.
5. Investigate the feasibility of installing and maintaining effective carp barriers in select areas to reduce carp production and enhance production of other species adversely affected by carp activity.

**Table 9.** Stocking record for East Oakwood Lake, Brookings County, 1991-2010.

<b>Year</b>	<b>Number</b>	<b>Species</b>	<b>Size</b>
1991	27,780	Yellow Perch	Fingerling
	7,330	Walleye	Lrg. Fingerling
	4,176	Walleye	Sml. Fingerling
	209	Walleye	Adult
1992	300,000	Northern Pike	Fry
	30,000	Northern Pike	Fingerling
	51,850	Yellow Perch	Fingerling
1994	36,610	Yellow Perch	Lrg. Fingerling
	8,620	Yellow Perch	Adult
1995	41,000	Fathead Minnow	Adult
	135,000	Walleye	Sml. Fingerling
1996	2,707,000	Walleye	Fry
	136,840	Yellow Perch	Fingerling
1997	1,000,000	Walleye	Fry
1999	1,000,000	Walleye	Fry
2001	100,000	Walleye	Fingerling
	10,159	Yellow Perch	Adult
2004	100,700	Walleye	Fingerling
2006	1,001,580	Walleye	Fry
2008	1,000,000	Walleye	Fry
2010	1,000,000	Walleye	Fry

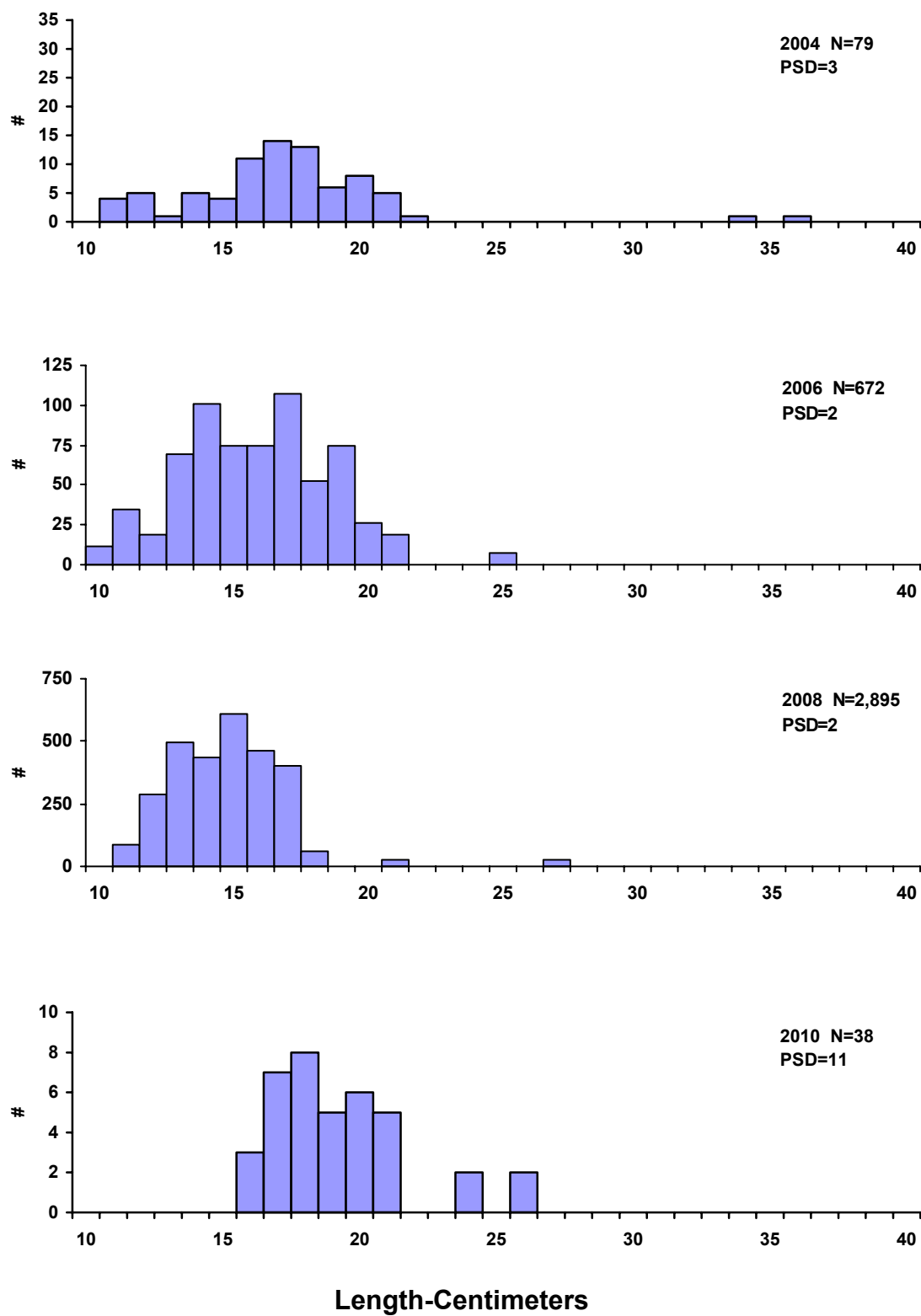


**Figure 1.** Length frequency histograms for walleye sampled with gill nets in East Oakwood Lake, Brookings County, 2004, 2006, 2008, and 2010.



**Figure 2.** Length frequency histograms for yellow perch sampled with gill nets in East Oakwood Lake, Brookings County, 2004, 2006, 2008, and 2010.





**Figure 3.** Length frequency histograms for black bullhead sampled with trap nets in East Oakwood Lake, Brookings County, 2004, 2006, 2008, and 2010.

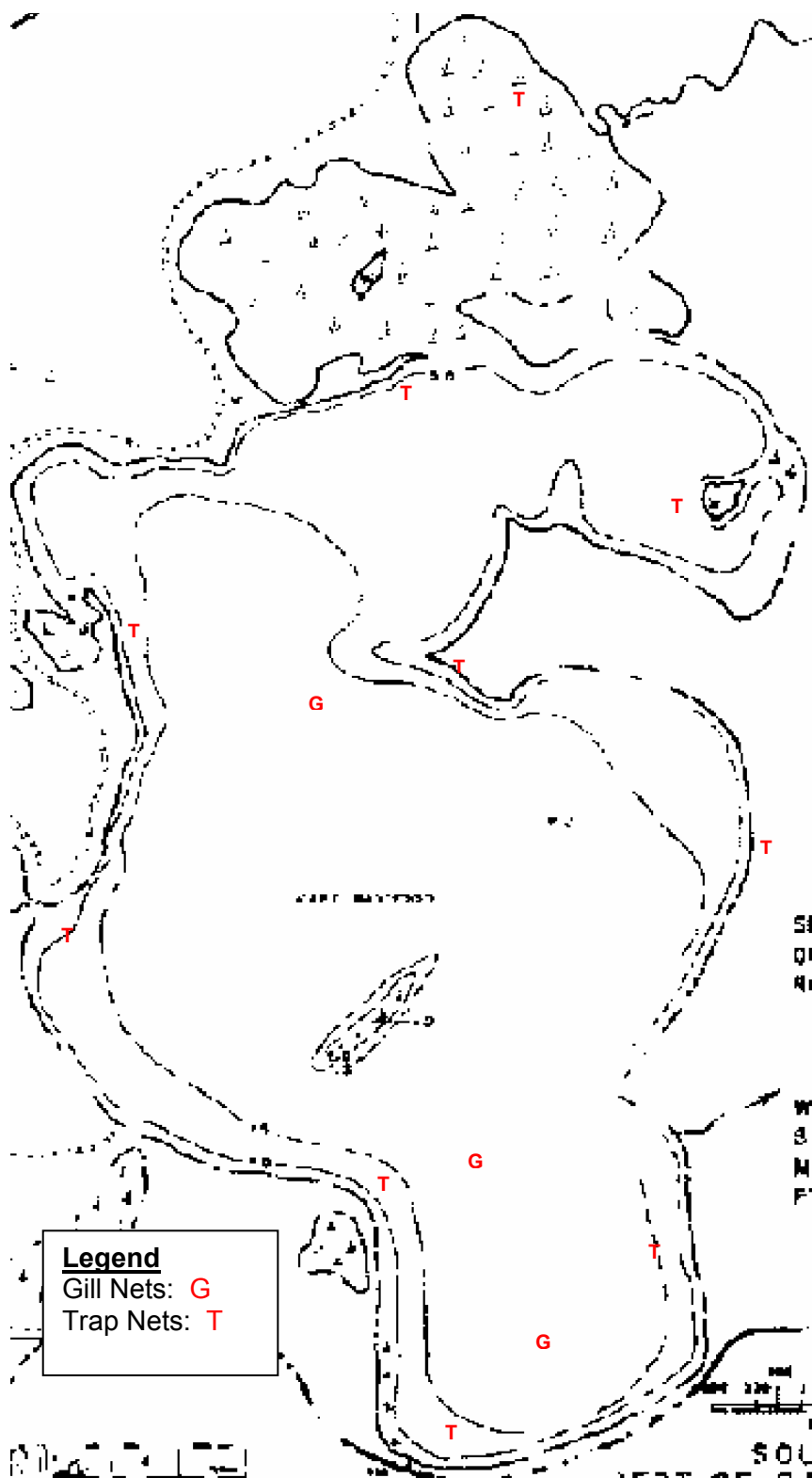


Figure 4. Sampling locations on East Oakwood, Brookings County, 2010.

**Appendix A.** A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

**Catch Per Unit Effort (CPUE)** is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

**Proportional Stock Density (PSD)** is calculated by the following formula:

$$\text{PSD} = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

**Relative Stock Density (RSD-P)** is calculated by the following formula:

$$\text{RSD-P} = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters. (inches in parenthesis).

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25 (10)	38 (15)	51 (20)	63 (25)	76 (30)
Yellow perch	13 (5)	20 (8)	25 (10)	30 (12)	38 (15)
Black crappie	13 (5)	20 (8)	25(10)	30 (12)	38 (15)
White crappie	13 (5)	20 (8)	25(10)	30 (12)	38 (15)
Bluegill	8 (3)	15 (6)	20 (8)	25 (10)	30 (12)
Largemouth bass	20 (8)	30 (12)	38 (15)	51 (20)	63 (25)
Smallmouth bass	18 (7)	28 (11)	35(14)	43 (17)	51 (20)
Northern pike	35 (14)	53 (21)	71 (28)	86 (34)	112 (44)
Channel catfish	28 (11)	41 (16)	61 (24)	71 (28)	91 (36)
Black bullhead	15 (6)	23 (9)	30 (12)	38 (15)	46 (18)
Common carp	28 (11)	41 (16)	53 (21)	66 (26)	84 (33)
Bigmouth buffalo	28 (11)	41 (16)	53 (21)	66 (26)	84 (33)

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

**Relative weight (Wr)** is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.